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Characteristics of thermal–mineral waters in Backa region (Vojvodina) and their exploitation in spa tourism

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ABSTRACT

Hydropower, biomass, biogas, biofuels, wind power, solar energy and geothermal energy are the major resources to provide Backa region with most of its. Backa extends between 45°16′ and 46°22′ of the northern latitude and 18°36′ and 20°37′ of the eastern longitude. It occupies the north-eastern part of Vojvodina, i.e. the most north-western part of the Republic of Serbia. That is historical-geographic territory bordered on the Danube on its western and eastern side, the Tisa on its eastern side and with the state border towards Hungary on the north. In this paper, the focus will be on renewable sources, specifically geothermal energy in Backa region. The paper analyzes the characteristics of thermal–mineral waters in Backa, the condition and possibilities of their exploitation in spa tourism, and in other economic branches. The tradition of thermo-mineral waters exploitation in spas and public baths is rather long. Today, this type of thermo-mineral waters exploitation in Backa is the widest spread. Permanent, i.e. continuous exploiters of thermal–mineral waters in Backa are primarily balneal–rehabilitation centres and exploiters using the water for technological purposes.

Contents

1. Introduction

The energy sources can be split into three categories: fossil fuels, renewable sources, and nuclear sources [1]. Hydropower, biomass, biogas, biofuels, wind power, solar energy and geothermal energy are the major resources to provide Vojvodina with most of its renewable energy in the future [2]. In this paper, the focus will be on renewable sources, specifically geothermal energy in Backa region.

Complex geological structure of the terrain in Serbia and other conditions and factors which in any way influence the appearance, regime and qualitatively quantitative and other features of thermo mineral waters in this region, which are also very diverse according to its mineral–chemical structure, temperature, presence of gases and similar. According to very favourable conditions and in harmony with planned development of Serbia based on using its natural potentials whose goal is more suitable and economical development and increasing its own national wealth in general, among priority raw materials of common social importance, should also be considered thermo mineral, mineral and gas waters, as also geothermal energy. Serbia is known for a great number of thermo mineral springs, even in European proportion. However, only the wealth of these motif values is not enough to use more rationally all potentials of spa and climate places [3].

Mineral waters, in the broadest sense of the word, have always attracted attention of wide circle of researchers and users. They have had the longest tradition which still lasts in the research and

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use in the domain of balneology, and that is the reason they have been treated as medicinal waters. In that sense, in the first and the second half of the 20th century they have reached the high level of development.

The researches and studies of mineral waters have become wider and diverse after The Second World War, which is understandable, as a result of growing interest of existing and potential consumers for their multiple uses. The existing and newly gained knowledge about them, starting from the conditions of their formation and existence, through the conditions of their restoration to the possibility of the use and protection, have enabled certain generalizations in the world level, which brought to big shifts in raising the level of theoretical knowledge about them. In that have especially excelled countries known for the large number of occurrences and known mineral waters deposits, among them there is also our country. Modern methods of research and gathering of researchers of different scientific disciplines have led to better and more versatile knowledge of waters, which also occurred in our area. That direction, which has been reached spontaneously during the past years, is more and more present in our practice, unambiguously forcing the need for interdisciplinary approach in research, exploitation and conservation of mineral waters [4]. The great occurrences of mineral and thermal springs on the territory of our country, and particularly the Serbia proper is conditioned by complex geo-tectonic state of the terrain, that is occurrences of larger number of interwoven deep fractions and fissures of secondary nature and also the occurrences connected to the existence of former volcanism.

These springs differ according to generosity, water temperature, chemical structure, and according to the way of therapy effect it has on the human organism. Their medicinal effect has been noticed long ago. That is why special settlements named with different terms have emerged close to them, today we use exclusively the term – spa [4].

2. The history of researches of thermo mineral waters in Backa

The first findings about the existence of thermo mineral waters in Vojvodina have been obtained at the end of the 19th and the beginning of the 20th century by boring of artesian wells. In the search for artesian water, the drillers have often reached the depth of 400 and even 600 m, in which they came across warm waters [5]. Such wells were the most often used for public bathhouses, as it is the case in Becej, Temerin, Kanjiza, Senta, Prigrevica, Zmajevo, etc.

With the beginning of researches of oil and gas in Vojvodina in 1949 the boring was going much deeper (even more than 2000 m). In that way, new experiences have been gained about the diffusion and quality of thermo mineral waters from bigger depths, which later enabled faster and more efficient research.

The more recent researches of thermo mineral waters and hydro geothermal energy in Vojvodina, i.e. Backa, have been going on in continuity from 1969 until today. For relatively short period of time, we became acquainted with the conditions of occurrences, geo-temperature regime and physical–chemical characteristics of waters, which enabled the transfer to second phase, the use of thermo mineral waters and hydro geothermal energy (Fig. 1) [6].

The first systematic and organized researches of thermo mineral waters in Vojvodina have begun in 1969, when "Naftagas" from Novi Sad on the suggestion of Provincial Committee of Energetics has accepted the programming, financing and realization of project for research and use of thermo mineral waters in Vojvodina. The first research bore according to this project was performed in Subotica in 1969. By the end of 1998, 73 hydro thermal bores with 62847 m have been drilled. The largest number of bores has been drilled in Backa (42), then in Banat (18), and the smallest number in Srem (13). Also, 23 systems for the use of thermo mineral waters have been built, partly for energetic, and partly for balneo-therapeutic and sports–recreational needs [5,8]. The largest intensity of well-drilling was in period between 1977 and 1990, when there were 2–7 well-drills a year. From 1991 when NIS-"Naftagas" stopped financing bores completely, the intensity of drilling has declined. The lack of funds of potential users, who then had to finance drilling themselves, partly or completely, the high initial investments and impossibility of gaining loans, have led to rapid decline of tempo of development.

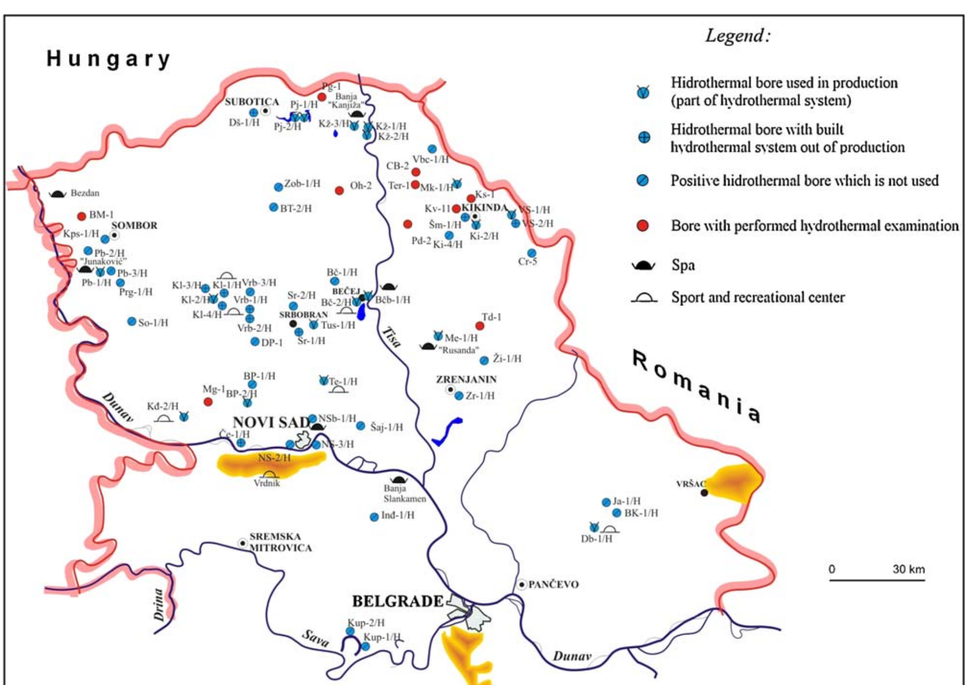


Fig. 1. Location of derived hydro thermal bores in Vojvodina.Source adapted to: Ref. [7].

Table 1
Review of basic indexes of some bores in Backa which are used for spas and sports-recreational pools.

Locality and sign of the bore	Caped interval	Generosity (l/s)	Water temperature (°C)	Total mineralization (g/l)	Content of therapeutic active components (mg/l)								Type of water
					J	Br	F	Li	Sr	$H_2S + HS$	HBO	$H_2SiO_3 + HSiO_3$	
Spa Kanjiza (Kz – 2/H)	895–965	11.8	64	4.1	0.9	–	4	0.1	0.2	–	20	7	HCO_3–Na
Spa Junakovic (Pb – 1/H)	596–712	36.6	59	6.5	6.5	8.1	3.3	1.2	5.6	1.2	60	95	Cl–HCO_3–Na
Bezdan spa	301–323	1.5	22	3	3.8	2.4	0.2	–	0.1	–	6	1	HCO_3–Cl–Na
Temerin Spa	483–603	20	41	3.6	–	–	–	–	–	0.5	2	6	HCO_3–Cl–Na
Becej spa	890–971	28.3	63	4	2.9	20	1.1	–	0.4	1.3	44	45	HCO_3–Na
Palic[a]	612–695	12.1	48	3.1	5	13	1.3	–	–	–	36	6	HCO_3–Na
Kula[a]	619–619–736	9.5	50	3.6	4.8	–	1.4	1.1	1.2	1.7	21	26	HCO_3–Cl–Na
Vrbas[a]	788–906	15.8	55	3.3	2	0.1	1.4	0.6	0.4	0.7	20	33	HCO_3–Cl–Na
Karadjordjevo[a]	440–485	5.7	34	3.6	0.5	1.5	4	–	0.2	1.7	4	20	Cl–HCO_3–Na–(Mg)
Domestic standard				001–2	001–10	005–25	2	001–5	2	001–10	005–50	005–50	–
European standard				1	1	–	2	–	–	1	–	–	–

Source adapted to: Ref. [6].

[a] Water is used for sports-recreational pools.

In the beginning the clearly researched wells were drilled for the purpose of regional study of hydro geological conditions, generosity, the quality of water, etc. In the later phase, while choosing the location, it was considered to put the bores close to some building so that if the results were positive the bores could have been used practically. At the end, they turned only to drilling of exploitation bores, for known user and known purposes of the use.

3. Characteristics of Backa thermo mineral waters

The beneficial effect of certain types of water on human organism is based upon their specific physical–chemical characteristics. Certain categories of mineral, thermal and thermo mineral waters, which thanks to appropriate physical–chemical characteristics show medicinal effect on human organism in larger amount than ordinary, according to certain authors, are called medicinal. Applying radioactive isotopes it has been determined that certain mineral substances from water, for example sulphur hydrogen, iodine, carbon dioxide and arsenic, penetrate during the bath through the healthy human skin into the organism and affect it actively.

Depending upon the physical characteristics and chemical structure, medicinal waters are used as additional remedy and medical rehabilitation of many acute and chronic illnesses. They are applied in external procedure (bathing the entire body or certain parts, exercising in swimming pool and underwater tractions) and internal use (drinking, sprinkling, gastritis rinse, enema and gurgling) [4]. In addition to using medicinal waters in spas are also used peloides (healing mud). There are also various kinds of peloides depending upon mineral–chemical structure. Peloides of the Kanjiza spa are known for its quality.

Medicinal waters and peloides affect the human organism in such way that they provoke local changes on skin and mucous membrane by direct influence of mechanical, thermal and chemical factor. Under the influence of these balneo-logical factors comes to the change in cell and out-cell liquid of the organism and to complex reactions of adjustment, as a result of stimulation of receptors (thermo and mechanic-receptors of the skin, chemo-receptors and baro-receptors). It means that balneo-logical factors have local and general effect on human organism.

To evaluate the quality of medicinal waters balneo-logical criteria are applied with which the following elements are valued: water temperature, pH value, total mineralization, then macro components, i.e. the presence of ions, sodium, calcium, magnesium, hydro carbonates, chlorides, sulphates and at the end, the presence of micro components of iodine, bromine, lithium, fluorine, strontium, meta silicon and meta boric acid, and from gases carbon dioxide, hydrogen sulphide, nitrogen and oxygen. According to balneo-logical criteria thermal mineral waters in Backa satisfy most of criteria and contain larger number of listed therapeutic components.

Temperatures of thermo-mineral waters in Backa as measured at the mouth of hydro thermal wells mainly range between 45 and 65 °C, with the maximum measured value of 82 °C compared to oil wells measured temperatures which range up to 160 °C. In balneal therapy water temperature is an important additional factor within balneal procedures. Today waters with the maximum temperature of 64 °C are used in spas in Backa (Table 1).

According to their active reaction, thermo-mineral waters in Backa are classified as mainly neutral (pH 6.8–7.2), mild alkaline (pH 7.3–8.5) and alkaline (pH 8.5). Alkaline environment causes swelling and softening of the epidermis and increases the elasticity of skin, thus having positive effect on various skin and gynaecological diseases.

Both total mineralization and balneal therapy with ionic features are assigned key roles in balneal therapy. The level of

balneal therapy effect is proportional to the increase of respective factors. Thus, the total mineralization range is rather wide having the values from 0.8 to 38 g/l. Today, waters with total mineralization from 2.6 up to 6.5 g/l, alkaline (HCO_3–Na) and alkaline–hydrochloric type (HCO_3–Cl–Na) are used in spas in Backa. Waters with total mineralization from 0.4 g/l up to 4.5 g/l (the same type as in spas) are used in swimming pools [6].

In Backa the most frequently distributed spas are iodine spas. They appear in all stratigraphic layers and on all levels. Bathing in iodine waters dates back to the late 19th and early 20th century in several "iodine" spas and baths in Novi Sad, Becej, Temerin, Kanjiza, and Bezdan. According to domestic standards, the waters containing more than 1 mg/l of iodine are classified as iodine waters. Also there is unavoidable presence of bromide with iodine. Thus, bromine–iodine waters are widely recognized in treatment of hypertension, due to their positive impact on cardiovascular system and fewer restrictions compared to sulphide baths. On the other hand, sulphide baths have positive impact on chronic and degenerative rheumatic diseases, extra articulation rheumatism, traumas and injuries, surgeries on bone–articulation system, and secretion release – through the inhalation the coughing out is easier in patients with chronic lung diseases. Extremely high results in medical treatment are achieved if there is, apart from iodine, high general mineralization and higher temperature.

Meta-siliceous ($H_2SiO_3 + HSiO_3$) and meta-boric acid (HBO_2) are frequently found in thermo mineral waters in Backa. Their higher concentrations are recorded in Mesozoic, Miocene and Pontic waters.

Sulphide hydrogen is found in waters of all stratigraphic layers. The data on sulphide hydrogen are unreliable due to the fact that few analyses have been conducted on the spot. Sulphide hydrogen is unavoidable element of thermo mineral waters in Backa, but it is also found in small concentrations (maximum of up to 4.8 mg/l). According to its high pH values, it is mainly found in ionic form (HS).

Recently balneologists have pointed to the importance of organic substances in thermo mineral waters in the act of different procedures. Russian balneologists have been the first to point to the balneo-logical importance of organic substances. Regardless of their small concentration, their balneo-logical importance can be very large.

4. State and possibilities of the use of thermo mineral waters in Backa

The constant, i.e. continued users of geothermal waters in Vojvodina are before all balneo-logical–rehabilitation centres and consumers who use thermal waters for technological needs.

The first group of consumers is made of actually combined consumers, since continued use can refer only to the one applied during the whole year for balneo-logical needs and recreation in closed and open pools. The rest of consumption of thermal waters is directed for heating of mentioned facilities. The most important consumers of this group are:

1. Spa "Junakovic" (Pb – 1/H) uses thermo mineral water for heating of spa's facilities, balneo-therapy and recreation in swimming pools. The total heat power of the bore amounts 2.54 MW and for the first time in Vojvodina heat pumps for heating have been used in this hydro thermal facility. The possible annual substitution of crude oil according to the planned capacity amounts 1228 t.
2. Spa "Kanjiza" (Kz – 1/H, Kz –2/H, and Kz – 3/H) uses thermo mineral water for the heating of facilities in installations with low temperature regime of work, for balneo-therapy and recreation. Thermal water has been installed as sanitary warm disposable water in all rooms used by guests. The total heat power of bores amounts around 2934 t of crude oil.
3. On bore in Becej (Bc – 2/H) industrial factory has been built with the possibility of heating more thoroughly thermo mineral water with detached gas. Water is used in sports–recreational centre for heating of facility, preparation of warm disposable water and for heating of water in the closed swimming pool. Part of thermal water is used for heating of building of nearby spa and the hotel "Bela ladja" ("White Ship"). The total heat power of bore amounts 4.53 MW, and according to the project there can be substituted 2097 t of crude oil a year.
4. Two hydro thermal bores in Kula are used for technological needs during the entire year: for rising out wool in the factory of wool fabrics "Sloboda" (Kl – 4/H) and for treatment in the procedure of tanning skin in the factory Eterna (Kl – 2/H). If the total annual consumption of thermal water was reduced to energetic level (the total heat power of these bores amounts 3.70 MW), according to projected capacity on these two bores could be substituted 1155 t of crude oil a year.

Second large group of consumers make seasonal consumers who use thermal water for heating and in sports–recreational pools, reminding the fact that in the first case water is used for energetic needs in winter months, and in the second for recreation in summer months. Typical representatives of this group of consumers are open recreational pools on hydro thermal systems in Temerin (Te – 1/H) and in Palic (Pj – 1/H) [8].

The largest use is present practically in non-energetic area, i.e. in spas and sports–recreational centres. The main goal, however, of the use of geothermal water is energetic area for the purpose of substitution of classical types of fuel, which means that the structure of consumption would have to change in favour of the second field of use.

According to foreign and domestic experience, it is estimated those geothermal waters in Backa, considering its physical–chemical and geothermal characteristics could be used in the following areas:

- In agriculture for heating of greenhouse.
- In cattle and poultry raising for heating of farms.
- In industry as technological warm water.
- In balneo-therapy and sports–recreational-tourist centres.
- For heating of towns and other buildings.
- For supplying the population with sanitary warm water.
- In fishing and similar.

Water, gas, physical–chemical, mineralogical and particularly thermal effects of thermal, mineral and low mineral (oligo mineral or spring) waters are nowadays used in over 60 different fields and sectors of use. We use it in only three – balneology, for bottling of now less wanted in world mineral waters and symbolically for heating.

5. Thermo mineral waters in spa tourism in Backa

Spas in hydro geological and geothermal, i.e. hydro thermal sense represent localities where the exploitation of the appearance of thermal waters as well as their usage aimed at healing and convalescence of a human organism are performed, i.e. they are used for balneo-logical purposes. The appearances of thermal waters are actually contemporary hydro thermal phenomena that can be either natural, such as springs or artificial, such as borings with thermal waters. Spas inevitably represent a great natural wealth with multiuse possibilities of their exploitation, and one of them is certainly spa tourism.



Fig. 2. Position of spa and sanatorium centres in Backa.

In Backa have developed three spas (Spa "Junakovic", Spa "Kanjiza" and Spa "Palic") and four sanatorium centres (Becej, Bezdan, Temerin, Novi Sad) until today (Fig. 2).

Spa and sanatorium centres in Temerin, Novi Sad, Becej and Bezdan are used only by local population and patients who come to these spas for treatment. They do not have appropriate material base for development of spa tourism, so in this chapter Spa "Kanjiza", Spa "Junakovic" and Spa "Palic" will be analyzed, which except for medicinal function, have also developed tourist function. One of the prerequisite of development of these spas are certainly natural factors, which together with social ones make complex base of development of spa tourism.

5.1. Spa "Kanjiza"

Spa "Kanjiza" is located in northern part of Potisje in Backa, in north-eastern part of the city Kanjiza. Spa "Kanjiza", slightly leaned on the bank of Tisa, is spa centre in the north of Vojvodina. Although it is located peripheral in respect to Serbia, it offers wide range of possibilities for the development of spa tourism, which would not only be based on treatment, but also on preventive, which comprises rest, recreation, sports competitions, cultural happenings and of course, scientific and administrative meetings.

Since the beginning of the 20th century in this area has been performed number of boring and research of thermo mineral waters. Since 1908, the first analyses of thermo mineral water on a bore 6 km west from the city in the part of les terrace "Pasnjak" ("Pasture"). Artesian well was bored to the depth of 183 m. Water that was obtained had temperature of 27 °C. Nearby was soon bored one more well which gave water temperature of 17.2 °C. City Council of Kanjiza opened in 1913 spa under the name "Bathhouse of miraculous well in Kanjiza" ("St. Kanjisko kupatilo cudotvornog bunara"). Wells gave 300–350 l/min. Water from the first well was by pipes installed to the old building, today's "Abela", in walled up underground reservoir, and water from the second well was left to flow freely, so that a small pond was created and from its banks medicinal mud was taken and used for the preparation of compresses (peloid) and mud baths [9]. This thermo mineral water has alkali reaction (pH 8.3) and belongs to the group of hypothermal waters. It comprises ions of sodium and hydro carbonate. The most important medicinal components which comprise this thermo mineral water are hydrogen-sulphide (H_2S), carbon-dioxide (CO_2), iodine (J) and flour (F). Thermo mineral water in Spa Kanjiza is used for therapy of bathing in therapeutic pools and also for swimming in two closed pools. Building "Aquamarin" is heated by thermal water, and it is planned to heat all the buildings in the same way. Existing three bores give enough amounts of warm water for heating, therapies, bathing and sanitary water in all rooms.

Indication area of Spa "Kanjiza" is wide. Here, patients with rheumatic diseases (in still phase of the disease) are treated, patients with diseases and injuries of bone-joint system, diseases of muscles and nerves. There are more and more patients after the spine surgery and patients with artificial hips. In Spa there is a special ward for rehabilitation of children. Spa Kanjiza is the only spa that applies the method of underwater extension of spinal column.

Besides thermo mineral water and peloides, Spa possesses complete electrotherapy and other therapies which modern medicine uses today. All those therapies with expert work of medical staff make the power and treasure of this Spa.

In Spa Kanjiza different kinds of therapies are applied: electrotherapy, thermotherapy, hydrotherapy, kinesi-therapy, magnet therapy and the others.

In Spa Kanjiza there is a Sports hall with 600 seats, which has necessary equipment for so called "small sports" (handball, mini football, basketball, volleyball, table tennis, judo, wrestling), so it can be used not only for recreation, but also for preparation of top

athletes. It also has devices for air-conditioning so it is suitable for organizing various sports and entertaining shows. There are also handball, football and two tennis courts, and also modern equipped gym with 12 devices.

In building "Aquamarin" there are two closed pools with thermal water, with dimensions of 25 m × 12.5 m and 10 m × 8 m. The larger pool is deep enough for swimming. Besides patients, citizens also have the access to pools for recreational purposes. There are also sauna and trim-section under the supervision of recreation trainer. There is a possibility of organizing trips to Lake Palic, Ludosko lake, Horse farm Zobnatica and similar. During the summer months we organize lunch for patients in holiday resort of the Institute, on the bank of river Tisa [3].

5.2. Spa "Junakovic"

Spa "Junakovic" is located in the northwest of Backa, 4 km away from Apatin. Thermo mineral waters have great importance in the area of Apatin borough. The first well with thermo mineral water was bored with the intention to find drinking artesian water in Prigrevica in 1913. From the depth of 312 m warm water flew. Water belongs to alkali-muriatic, bromine iodine waters with temperature of 25 °C [10]. From 1977 to 85 five new wells with thermo mineral water were bored. The first well is on the depth of 480 m, it gives water temperature of 36 °C, in the amount of 60 l/min. The second well is bored at the depth of 600 m, with the temperature of 34 °C, and generosity of 90 l/min. The third well is drilled at the depth of 700 m, temperature of water is 51 °C, and generosity is 3000 l/min. This well supplies Spa "Junakovic" with water [3].

According to its physical–chemical characteristics mineral water belongs to category of sodium, hydro carbonate, chloride, iodine, sulphide well-mineralized hyper thermos.

In Spa "Junakovic" it is about well-mineralized water with large amount of sodium, chloride, important amount of iodine, hydro carbonates and hydrogen-sulphide. Water temperature amounts 49 °C, which gives a lot of possibilities for using by cooling up to appropriate temperatures, depending upon therapeutic needs [11].

On the basis of all above-mentioned qualities (mineralization of anionic-cationic structure, amount of iodine and hydrogen-sulphide) this mineral water can be used in balneo-therapeutic purposes as additional medicinal remedy and by bathing, together with cooling up to appropriate temperatures, for the following chronic diseases: diseases of locomotive apparatus, gynaecological diseases, neurological diseases, as inhalation therapy at chronic obstructive diseases of lungs.

In Spa "Junakovic" it is performed diagnosis, treating and rehabilitation of injured and ill persons and prevention and recreation of healthy persons.

Spa has modern equipment for physical treatment and rehabilitation. In the first place here is used hydrotherapy in baths and pools, kinesi-therapy, electrotherapy, thermotherapy, work therapy, massage and acupuncture.

Sports–recreation services complement board services of visitors who come to the Spa to rest, but they are also important for visitors who come here for health treatment. In the Spa building there is a smaller closed pool which is at the moment mainly used for medical treatment, it is less important for recreation (swimming). There is a plan to build closed pools of larger dimensions which would primarily be important for recreation of guests, preparation of sportsmen, visits of guests from the areas close to the Spa. Building of pools would be important for increasing the total number of guests during the whole year.

In the building there are also two saunas which are momentarily out of function, but are used during organized visits of sportsmen. Outside of the building guests have at their disposal for recreation trim track (track for walking) in the forest "Junakovic" which surrounds the Spa and its length is 1.5 km. This trim lacks benches on which older guests and those on medical treatment could rest during the walk. Besides the track, four tennis courts have been built for recreation of guests, but they are not momentarily maintained, so they are out of use. Courts for mini football, handball, and basketball have also been built and they are mainly used during the summer period, when there are a lot of swimmers in the Spa who besides swimming in pools spend their time playing basketball or mini football.

For recreation the most important are eight open pools of different dimensions. Sports–recreational part with pools comprises of open Olympic pool with the size of 25 m × 50 m, stands for 300 spectators, its depth is 2.20 m, three open children's pools of the depth of 0.2–0.5 m, four pools together with diving board and the depth of 1.40–3.80 m; sanitary facilities and dressing room. Pools have excursion importance since visitors from surrounding towns are numerous. Pools have capacity over 3000 swimmers, but the season for swimming is reduced to three summer months [3].

5.3. Spa "Palic"

It is possible in the case of Spa Palic to trace characteristics of natural medicinal factors through time, from 1840 to 1998, when the last researches were conducted. Through history and today, we have traced indexes for: medicinal mud (mud from the lake), water from Palic lake, thermo mineral water from bores Pj – 1/H, and Pj – 2/H, climate, the rest of the factors – quality of surrounding (greenery, environment, natural and cultural–historical treasures and the others), medicinal mud – peloid [12].

Water belongs to category – sodium, hydrocarbonate, iodine, fluoride, borate, sulphide, hyper thermal, mineral waters [13]. Water temperature is at the output 47.5 °C, while at the bottom of the bore it is around 63.0 °C, so that the water is classified into hyper thermal and for use it has to be cooled. Water is medicinal and it affects the range of diseases – from bones to the other parts of organism. Water can easily be used by drinking where considerable amounts of iodine and flour are expressed fully.

Present state in Spa "Palic" considering the possibility of treatment in facilities of special purpose is such that the treatment is conducted partially or in Subotica hospital, and by that mud and water from Palic is used. The following facilities now offer sanatorium and therapeutic services in Palic:

- Open pools with thermal water which are filled in May and emptied in October and which are part of hotel "Sport".
- Saunas, steam baths, massage and the others in the hotel.
- Baths, halls for massage and dressing rooms in "Muski Strand" ("Men's strand").

The concept of development of tourism of Spa Palic continues the tradition from the 19th century, and that is building of sports courts and practicing all recreational activities on water and ice. On protected Lake Palic, in the 3rd and 4th specified zone which has 380 ha, whose shore is approximately 17 km long, there are possibilities for various recreations and sports during summer and winter season for large number of visitors.

Existing recreation buildings are: tennis courts, trim track, automatic bowling centre, three football courts, three handball courts, 6 volleyball courts, 2 basketball courts, 1 athletics court, 4 bowling centres, bicycle-trim track, children's playground in the zone of the Big park. In the central part of the Big Park there is women's bath-Women's strand, and in the eastern part of the Big Park there is a Men's strand. Both buildings are unique according to architecture and content and with constant maintenance they

preserved authentic look and construction from the 19th century. The length of shore which is repaired for swimming is around 4 km, it has toilettes and it represents a special offer for rest and recreation of guests [3,14].

6. Conclusion

In the area of Backa spa tourism is not researched sufficiently and we cannot be satisfied with the total results of the development of spa tourism. Reasons are numerous – large number of springs is not valorised and there appears to be unused potential, tourist offer is one-sided and incomplete, differentiation of sanatorium and tourist functions are unsatisfactory, tourist advertising is inadequate, there is organizational and staff defectiveness, lack of necessary systematic and continued researches of regional and local character, in terms of not only valorisation of potential reserves, but also in terms of keeping the existing ones, absence of adequate planned and programmed documents necessary for development and similar. All these elements represent limiting factors for the development of spa tourism in Backa, and which should be taken into account in the future planning. Spas should be basis of development of tourism, as in Backa, Vojvodina, and the entire Serbia, but only a few of 30 nominated in Serbia, in the right sense of the word are spas.

Degree of use of thermo mineral waters in Backa is very unequal, from primitive, unorganized way of their use to organized use in modern medical centres or in centres for recreation. In Backa ''Kanjiza'' and ''Junakovic'' are spas with the most complete tourist offer, they have the most developed hotel capacities and the following infrastructure, extremely high level of medical services, staff and equipment is reached, which led to multiplying of their tourist functions, so that we can talk about polyvalent tourism.

Backa indisputable has great thermo mineral potential which makes important component of complex development of continental tourism. Tourism could and should become dominant economic branch in most of the spas in Backa, but before that effort has to be put into construction of material base and all preconditions for organized tourism.

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